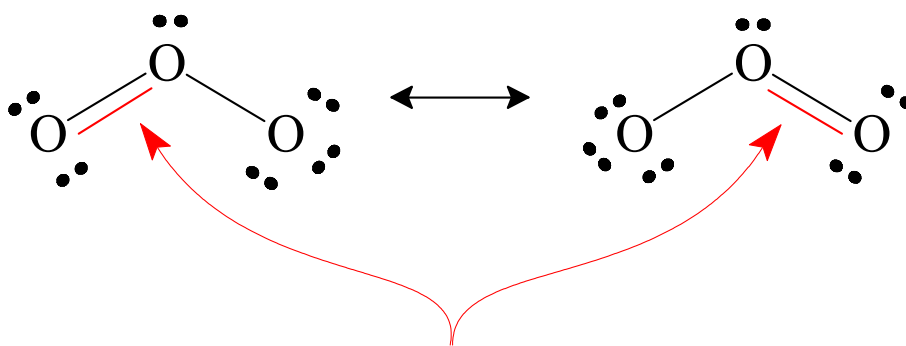
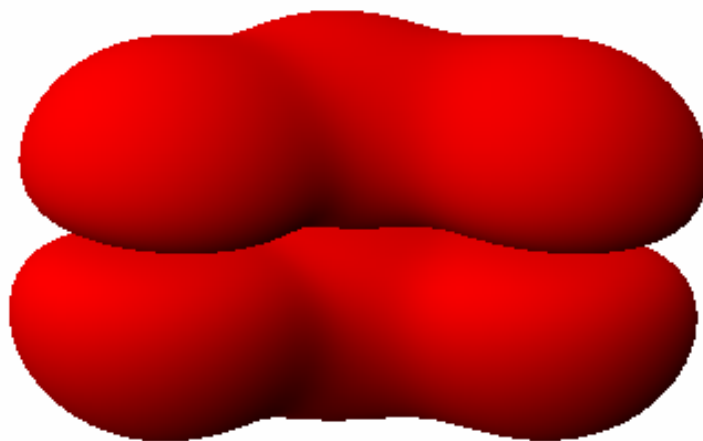


## Delocalized Pi Bonding

- L Whenever a molecule or ion is a resonance hybrid of two or more canonical forms showing double or triple bonds, the electron pairs moved about from form to form are actually delocalized over the affected bonds in a  $\pi$  system.

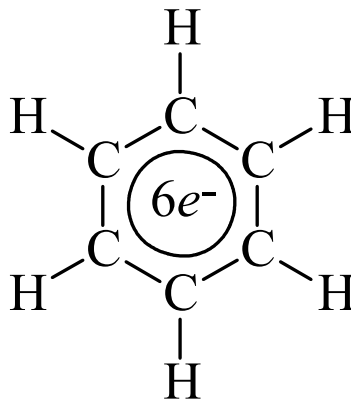
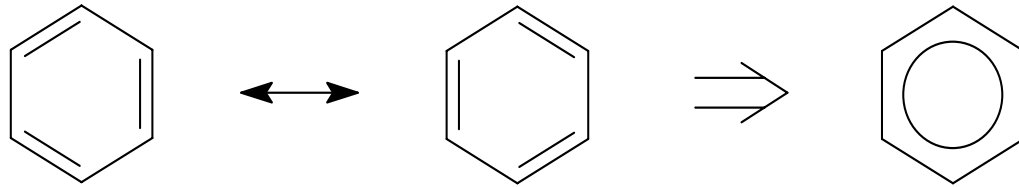


electron pair delocalized in  $\pi$  system



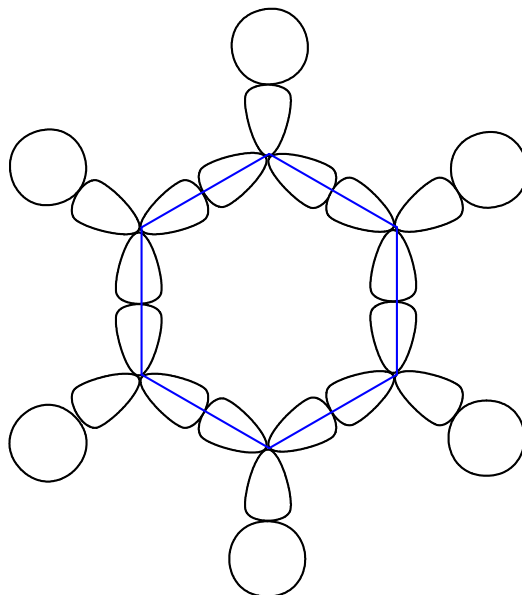
## Benzene, $C_6H_6$

- L The two Kekulé resonance forms suggest that the six electrons used to form the three double bonds in the canonical forms are  $\pi$ -delocalized.



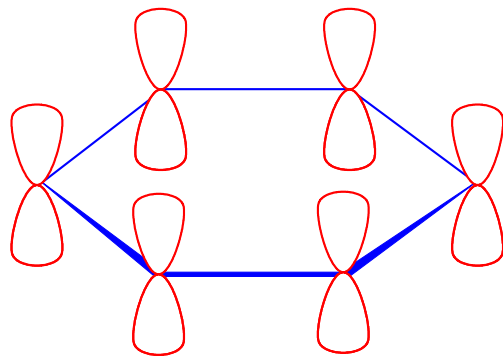


## VB Model of Benzene Sigma Bonding

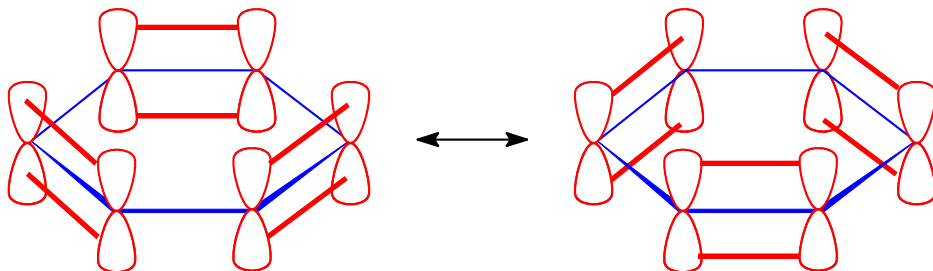


- Carbon atoms are  $sp^2$  hybridized.
- C–C  $\sigma$  bonds are formed by overlap of  $sp^2$  hybrids on adjacent carbon atoms, sharing 6 pairs of electrons (2 electrons from each carbon).
- C–H  $\sigma$  bonds are formed by overlap of remaining  $sp^2$  hybrids on carbon atoms with  $1s$  orbitals on hydrogen atoms, sharing 6 pairs of electrons (1 electron from each C and 1 electron from each H).

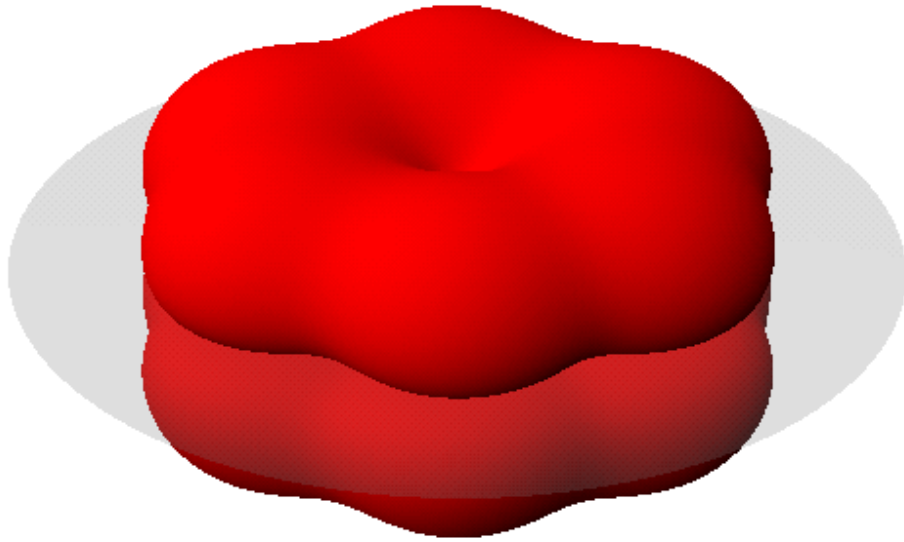
## VB Model of Benzene Pi Delocalized System



- Each  $2p_z$  orbital on each carbon atom contributes one electron to the  $\pi$  system (6 electrons total).
- The two Kekulé canonical forms, showing localized  $\pi$  bonds:



## **Pi Delocalized System in Benzene**



## Nitrate Ion Pi Delocalization

